

PROFESSIONAL TRAINING- I REPORT

Submitted in partial fulfilment of the requirements for the award of bachelor of
technology degree in biomedical engineering

By

SNEHA BABU PAUL (41240032)



DEPARTMENT OF BIOMEDICAL
ENGINEERING SCHOOL OF BIO AND
CHEMICAL ENGINEERING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with grade "A++" by NAAC

JEPPIAR NAGAR, RAJIV GANDHI SALAI, CHENNAI -600 119

OCTOBER – 2023



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A++" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

DEPARTMENT OF BIOMEDICAL ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this professional training report is the bonafide work of SNEHA BABU PAUL (41240032) who has completed the training program in SATHYABAMA RESEARCH PARK as a part of professional development under our supervision from 19.09.2023 to 25.09.2023.

Internal guide

External guide

Head of the Department

Head of the Department
Department of Biomedical Engineering
Sathyabama Institute of Science & Technology
(Deemed to be University)
Category I University by UGC
Jeppiyazh Nagar, Rajiv Gandhi Salai,
Chennai - 600 119

Submitted for the Viva Voce Examination held on 03/10/2023

Internal examiner

External examiner



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE
www.sathyabama.ac.in



Exploring Bioanalytical Tools and Techniques for Drug Discovery

CERTIFICATE

This is to certify that Sneha Babu Paul has attended the Training session on "Exploring Bioanalytical Tools and Techniques for Drug Discovery" from 20th to 25th September 2023 jointly organized by the Department of Biomedical Engineering and Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology.

Dr. Krupakar Parthasarathy
Convener

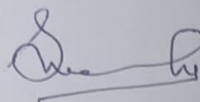
Dr. T. Sudhakar
Convener

Dr. M. Radhakrishnan
Centre In-charge

Made for free with Certify'em

DECLARATION

I **SNEHA BABU PAUL** hereby declare that the professional training report completed by me during my professional training at Sathyabama Research Park under the guidance of **Dr. A. Sabarivani, M.Tech., Ph. D.** and **Ms. Sindu Divakaran** is submitted in partial fulfilment of the requirements for the award of Degree in Bachelor of Technology in Biomedical Engineering.



SIGNATURE OF THE CANDIDATE

DATE: 03.10.2023

PLACE : CHENNAI

ACKNOWLEDGEMENT

I wish to express my most sincere and profound gratitude to our beloved **Founder Chancellor Col. Dr. JEPPIAR, M.A. ,B.L., Ph. D.**, for providing me an opportunity to educate myself.

I am also pleased to acknowledge sincere thanks to our **Chancellor Dr. MARIAZEENA JOHNSON, B.E., M.B.A., M.Phil., PhD.** and President **Dr. MARIE JOHNSON, B.E., M.B.A., M.Phil., PhD.** and our beloved Vice President **Mr. J. ARUL SELVAN**, **Ms. MARIA BERNADETTE TAMILARASI**, **Ms. MARIA CATHERINE JAYAPRIYA** of Sathyabama Institute of Science and Technology, Chennai, for their unwavering support to carry out my research work.

I am truly thankful to our Vice Chancellor **Dr. T. SASIPRABA, M.E., Ph.D.**, to our Pro Vice Chancellor **Dr. E. LOGASHANMUGAM , M.E., Ph.D.**, our beloved registrar **Dr. S.S. RAO MBA., Ph.D.**, our Director of Administration **Dr. G.SUNDARI M.E., Ph.D.** for their kind encouragement and support.

I would like to extend my thanks to **Dr. B.SHEELA RANI ,M.S., Ph.D.**, Director (research), Our Dean of school of Bio and Chemical sciences **DR. RAMESH KUMAR, M.Sc., Ph.D.** our head of the department **Dr. T. Sudhakar M.Sc., Ph.D.**, and our professional training guides **Ms. SINDU DIVAKARAN** and **Dr. A.SABARIVANI ,M. Tech., Ph.D.** Thank you for being a part of this educational journey with us.

I'm genuinely thankful for the opportunities offered to me by **Dr. KRUPAKAR PARTHASARATHY ,DR.M.RADHAKRISHNAN** ,Centre-In-Charge, at Sathyabama Research Park, their mentorship, guidance and patience created a welcoming and conducive learning environment

I also wish to express my thanks to all the Teaching and Non-Teaching staff members of the department of biomedical engineering who were helpful in many ways for the completion of the report.

ABSTRACT

This report provides a comprehensive overview of my internship experience in the field of biomedical engineering at SATHYABAMA RESEARCH PARK, Chennai from 19.09.2023 to 25.09.2023. I had the privilege of working alongside a dedicated team of healthcare professionals under the guidance of Dr.KRUPAKAR PARTHASARATHY ,DR.M.RADHAKRISHNAN , gaining firsthand insights into the pivotal role of biomedical engineering in modern healthcare.

This internship encompassed a range of activities including the maintenance, their working and designs.A comprehensive tour of the institution's instrumentation provided an overview of the impressive range of instruments at our disposal. From high-throughput screening systems to state-of-the-art mass spectrometers to advanced microscopy setups, the wide variety of instruments was impressive. In the context of drug development, biomedical instruments form the backbone of research.

These advanced tools allow scientists to analyse, quantify and visualise molecular interactions, structures and processes essential to drug development. The report covers the duration of my internship, from initial orientation to project completion.Dive into my practical experiences, knowledge gained, and the broader impact of this internship on my future career in biomedicine.

At the heart of this research is a fascinating suite of tools, each carefully designed and precisely engineered to illuminate the complex molecular pathways and interactions that underlie new drug discovery. These instruments represent the cutting edge of modern science and are essential tools that enable researchers to explore new frontiers in medicine.

CONTENTS

CONTENTS	PAGE No:
I. INTRODUCTION	
INTRODUCTION	1
II. DRUG DISCOVERY INSTRUMENTS	
2.1. GENERAL	2
2.2. AUTOCLAVE	3
2.3. LAMINAR AIR FLOW AND CENTRIFUGES	5
2.4. SPECTROPHOTOMETER	6
2.5. PCR	7
2.6. RT-PCR	10
III. BIOSAFETY LABORATORY-VIROLOGY	13
3.1. CO2 INCUBATORS	
3.2. PHASE CONTRAST MICROSCOPE	16
3.3. ELISA READER AND WASHER	19
3.4. LUMINOMETER	22
IV. CONCLUSION	24
V. REFERENCES	25

LIST OF FIGURES

Fig: 2.1: Coaching	pg.2
Fig: 2.2: Autoclave (Type -1)	pg.4
Fig: 2.3. Autoclave (Type -3)	pg 4
Fig 2.4. Laminar Air Flow	pg.5
Fig 2.5. Laminar Air Flow Diagram	pg.5
Fig.2.6. Spectrophotometer	pg.6
Fig 2.7. DNA Template	pg.9
Fig 2.8.PCR	pg.9
Fig.2.9. RT-PCR	pg.12
Fig.3.1 CO2 INCUBATOR	pg.15
Fig.3.2 .CO2 INCUBATOR	pg.15
Fig.3.3 Phase Contrast Microscope	pg.18
Fig.3.4. Phase Contrast Microscope Principle	pg.18
Fig.3.5 ELISA Reader	pg.21
Fig.3.6.Luminometer	pg.23

ABBREVIATIONS

ABBREVIATIONS	WORD
FEATURES	FS
PCR	Polymerised Chain Reaction
RT-PCR	Real Time Polymerised Chain Reaction

CHAPTER 1

INTRODUCTION

Drug discovery is a dynamic and multifaceted process that includes the identification, design, development and validation of therapeutic agents. At the heart of this project is the need for accurate and efficient tools and techniques to study the behavior of molecules in biological systems. Bioanalytical tools and techniques are at the heart of this effort, allowing scientists to obtain important information about the pharmacokinetics, pharmacodynamics, and safety profiles of potential drugs. In this discovery, we delve deeper into the field of bioanalytical tools and techniques, highlighting their importance in modern drug discovery.

The drug discovery landscape is an exciting journey, characterized by constant innovation and the search for new treatment solutions. At the heart of this transformation are biomedical instruments, which form the foundation of modern pharmaceutical research. These tools, which include a variety of technologies, enable scientists and researchers to unravel the mysteries of biology, chemistry and disease. In this discovery, we delve deeper into the central role of biomedical devices in the dynamic field of drug discovery.

In the context of drug discovery, biomedical instruments are the backbone of research. These sophisticated tools enable scientists to analyze, quantify, and visualize the molecular interactions, structures, and processes essential to drug development. A comprehensive tour of the organization's instrumentation facilities provided an overview of the impressive range of equipment at our disposal. From high-performance screening systems to state-of-the-art mass spectrometers to advanced microscope setups, the variety of instruments is impressive. In the following sections of this report, I will delve deeper into my specific responsibilities and projects during my internship, highlighting practical applications of biomedical instruments in drug discovery .

CHAPTER 2

DRUG DISCOVERY INSTRUMENTS

2.1 GENERAL

In the ever-changing landscape of pharmaceutical research and development, the search for innovative and effective medicines remains a driving force. At the heart of this research is a fascinating suite of tools, each carefully designed and precisely engineered to illuminate the complex molecular pathways and interactions that underlie new drug discovery. These instruments represent the cutting edge of modern science and are essential tools that enable researchers to explore new frontiers in medicine.

From their key role in high-throughput screening to their contributions to structure elucidation and biological imaging, we will address the diverse capabilities of these tools and their profound impact on the development of innovative therapies. These tools are the creators of revolutionary discoveries, the interpreters of biological mysteries, and the drivers of progress in the pharmaceutical industry. They are key to understanding diseases at the molecular level, developing targeted therapies and ultimately improving the lives of millions of people.



FIG: 2.1

2.2 AUTOCLAVE

An autoclave is specialized equipment used in various areas, including laboratories, healthcare facilities, and industrial facilities, to sterilize items, tools, and equipment. It uses high-pressure steam and high temperatures to kill or inactivate microorganisms such as bacteria, viruses and spores so that items can be used or disposed of safely.

High pressure and temperature: Autoclaves use pressurized steam to reach temperatures well above the boiling point of water. This combination of high pressure and temperature ensures complete sterilization.

Sterilization Cycles: Autoclaves typically offer multiple cycles, including sterilization, drying and cooling phases, allowing customization to the type of items being sterilized.

Chamber: Autoclaves have a closed chamber in which the items to be sterilized are stored. This chamber is often made of stainless steel, which is durable and corrosion-resistant.

Control Systems: Autoclaves are equipped with control systems that allow users to set and monitor parameters such as temperature, pressure and cycle time. This ensures precise and even sterilization.

Medical and Laboratory Applications: In healthcare, autoclaves are essential to ensure the sterility of surgical instruments, medical devices and laboratory equipment. They play an important role in infection control and research.



FIG: 2.2



FIG:2.3

2.3 LAMINAR AIR FLOW AND CENTRIFUGES

Laminar airflow (LAF) is a controlled environment system commonly used in various industries including healthcare, pharmaceuticals, electronics, and research laboratories..

Key FS:

HEPA/ULPA Filters: LAF units use High Efficiency Particulate Matter (HEPA) filters or Ultra-Low Penetration (ULPA) filters to remove airborne particles such as dust, microbes and pollutants from incoming air.

One-Way Airflow: Filtered air is blown in one direction, typically from the top of the work area forward, creating a clean, controlled environment for tasks requiring aseptic conditions.

Sterile workspace: Laminar airflow is essential in applications requiring a sterile environment, such as cell and tissue culture, microbiology and pharmaceutical composites.

Types: There are two main types of laminar airflow systems: vertical laminar hoods and horizontal laminar airflow workstations.

CENTRIFUGE

Centrifuges are laboratory devices used to separate particles or substances from a liquid medium based on their density or size. They work thanks to centrifugal force, which causes denser materials to move outwards and settle at the bottom of the rotating container.

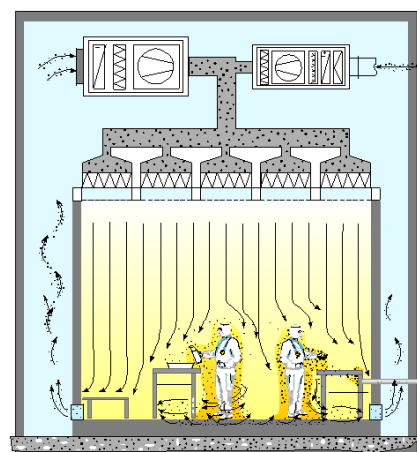


FIG:2.4

FIG:2.5

2.4 SPECTROPHOTOMETER

A spectrophotometer is an analytical instrument widely used in chemistry, biology, physics and many other scientific fields. It measures the intensity of light at different wavelengths, allowing scientists to analyze and quantify the concentration of substances in a sample based on their absorption or transmission properties. Spectrophotometers are versatile instruments with many applications and are available in a variety of designs, including UV-Visible (UV-Vis), Infrared (IR), and Fluorescence Spectrophotometer

Colorimetry: used in colorimetric tests in which the color intensity of the reaction product is measured at a specific wavelength, allowing quantitative determination of analytes



FIG : 2.6

2.5 PCR

Polymerase chain reaction (PCR) is a powerful molecular biology technique that amplifies or copies a specific section of DNA. Developed by Kary Mullis in the 1980s, PCR has revolutionized the fields of genetics, genomics, forensics and various areas of biological research. It allows scientists to reproduce DNA quickly and precisely, making it an indispensable tool for various applications. Here are the key principles and applications of PCR:

Denaturation: The first step is to heat the DNA sample to about 94°C to 98°C. The high temperature causes the DNA double helix to relax (denature) and separate the two complementary strands.

Annealing: The temperature is reduced to approximately 50-65°C so that the short DNA primers can bind to complementary sequences on each strand of the DNA template.

Extension: DNA polymerase, a heat-stable enzyme, extends primers by adding complementary nucleotides to the template strand. The temperature of this phase is typically around 72 °C. **Repetition:** Steps 1-3 are repeated several times (typically 20-40 cycles), with each cycle doubling the number of DNA copies. This exponential amplification results in millions or billions of copies of the target DNA segment.

Uses of PCR:

Genetic testing: PCR is used for genetic testing to detect genetic mutations, identify carriers of genetic diseases, and diagnose diseases caused by specific genetic changes.

DNA sequencing: PCR is often the first step in DNA sequencing techniques and allows researchers to amplify specific regions of DNA for sequencing analysis.

Forensics: PCR is an integral part of forensic DNA analysis and helps to identify suspects or victims and solve criminal cases by analyzing DNA from crime scenes.

Medical diagnostics: PCR-based tests are often used in medical diagnostics to detect infectious agents such as viruses (e.g. HIV, SARS-CoV-2), bacteria (e.g. tuberculosis) and parasites (e.g. HIV, SARS-CoV-2). .n.p. Malaria).

Polymerase chain reaction (PCR) has played a key role in the global response to the COVID-19 pandemic caused by the novel coronavirus SARS-CoV-2. PCR is the main tool for detecting the virus in individuals, monitoring the spread of the disease and studying the virus itself. This is how PCR is involved in the fight against the COVID-19 pandemic:

1. Diagnostic tests: PCR-based COVID-19 diagnostic tests are used to detect the genetic material (RNA) of SARS-CoV-2 in respiratory tract samples, such as a nasopharyngeal or throat swab. Reverse transcription- polymerase chain reaction (RT-PCR) is specifically used to convert viral RNA into complementary DNA (cDNA) before amplification. The PCR amplification method can also detect traces of the virus's genetic material, making it very sensitive and specific for diagnosing COVID-19.
2. Screening and surveillance: PCR tests are widely used in mass screening and surveillance activities to identify infected individuals, including those who may be asymptomatic or presymptomatic carriers of the virus. Frequent testing, contact tracing and isolation of infected individuals are essential strategies to contain the spread of the virus.
3. Surveillance variants: , PCR is used to analyze genetic sequences of the virus obtained from patient samples. This allows us to identify and monitor the emergence of new variants of SARS-CoV-2. Specific PCR tests can identify genetic markers associated with known variants, helping to monitor them.

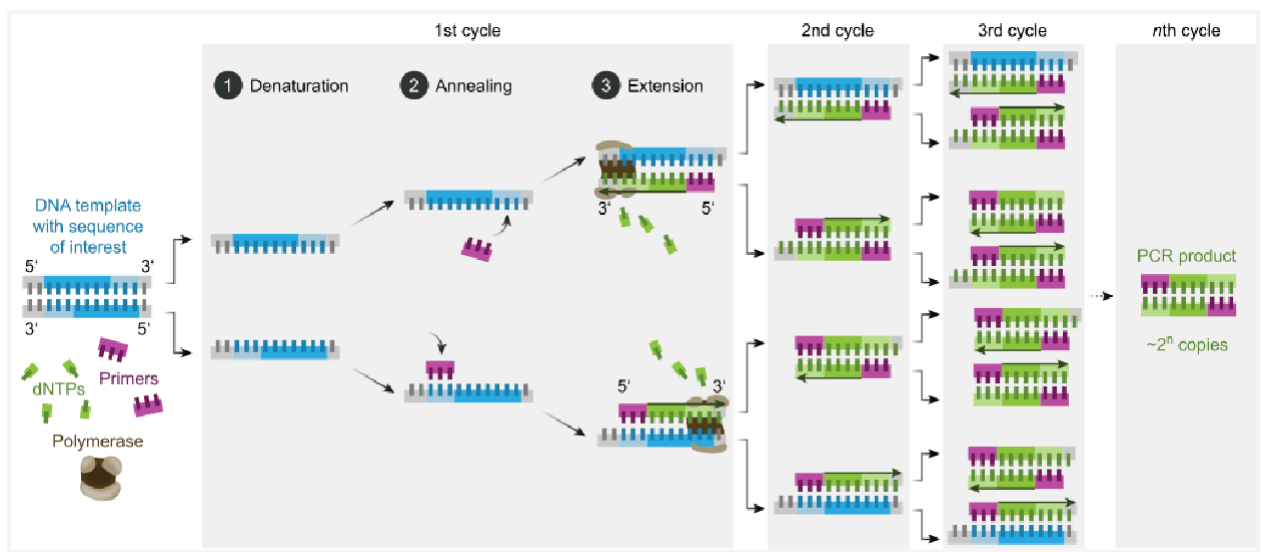


FIG :2.7



FIG:2.8

2.6 RT-PCR

Real-time polymerase chain reaction (real-time PCR), also known as quantitative PCR (qPCR), is an effective molecular biology technique for amplification and quantification of DNA molecules. It is based on the principles of traditional PCR and allows real-time monitoring of the DNA amplification process. Real-time PCR is widely used in various areas, including molecular biology research, clinical diagnostics, genetics, and environmental monitoring. Here are the key features and applications of the Real-Time PCR method:

Key FS:

Fluorescent Probes: Real-time PCR uses fluorescent probes or dyes that emit signals during the DNA amplification process. These signals are measured in real time, allowing the target DNA to be quantified. **Continuous monitoring:** Unlike traditional PCR, where results are obtained at the end of the reaction, real-time PCR allows continuous monitoring of DNA amplification. This allows you to define the cycle in which the gain reaches a certain threshold (Ct value).

Quantitative Analysis: Real-time PCR is primarily used for quantitative analysis and allows precise measurement of the initial amount of DNA in a sample. It can quantify gene expression, detect pathogens, and determine the presence or absence of specific DNA sequences.

Multiplexing: Real-time PCR can amplify and quantify multiple target DNAs simultaneously in a single reaction, making it suitable for high-throughput applications and multiplex assays.

Applications of Real-time PCR:

Gene Expression Analysis: Real-time PCR is often used to quantify the expression levels of specific genes. This helps scientists understand how genes are regulated and how they respond to different diseases or therapies.

Genotyping and allele discrimination: Real-time PCR can distinguish different alleles of a gene, making it valuable for genetic testing, population genetics, and forensic analysis.

Pathogen detection: Real-time PCR is used in clinical diagnostics to detect pathogens such as bacteria, viruses, fungi and parasites. This is crucial for diagnosing infectious diseases and monitoring patients' viral load (e.g. HIV viral load).

Microbial Identification: Real-time PCR enables the identification and quantification of microorganisms in environmental samples such as soil, water and air. It is used in microbiological, ecological research and water quality assessment.

Cancer Research: Real-time PCR is used to study genetic mutations, gene expression patterns and the presence of specific biomarkers associated with cancer. It helps diagnose, prognosis and monitor cancer treatment.

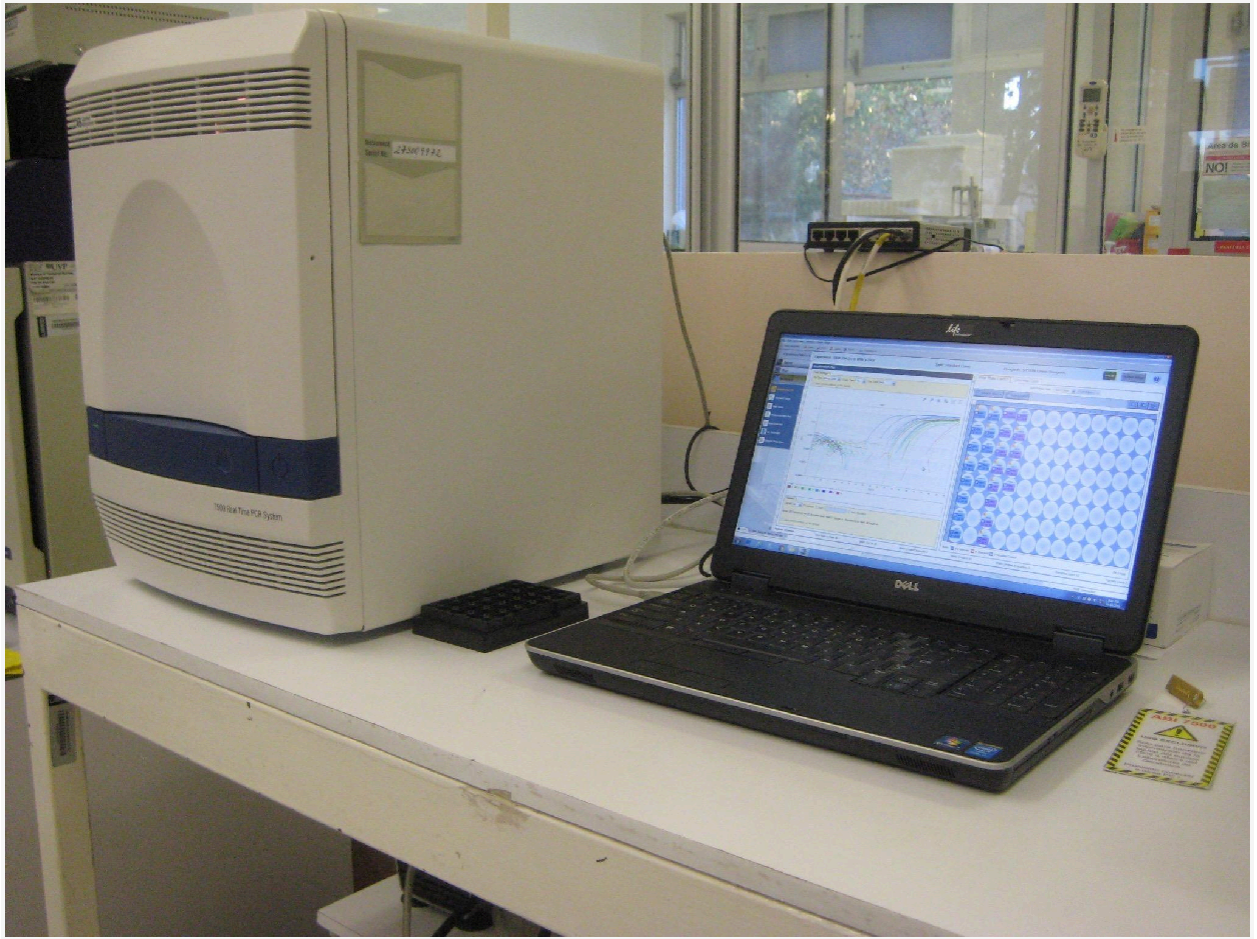


FIG:2.9

CHAPTER 3

BIOSAFETY LABORATORY-VIROLOGY

3.1 CO₂ INCUBATOR

A carbon dioxide (CO₂) incubator is specialized laboratory equipment that provides a controlled environment for the growth and maintenance of cell cultures and other biological samples. These incubators are widely used in cell biology, microbiology, tissue engineering and related fields where maintaining precise and stable conditions for experiments and cell culture work is crucial. Here are some key features and applications of CO₂ incubators:

Key FS:

Temperature Control: CO₂ incubators are equipped with precise temperature control systems that maintain a constant and uniform temperature throughout the incubator chamber. The typical operating temperature in cell culture is around 37 °C, which corresponds to the core temperature of the human body.

CO₂ Control: These incubators control the carbon dioxide (CO₂) level in the chamber to create a specific environment, usually around 5% CO₂. CO₂ is necessary to buffer the pH of the culture medium and promote cell growth.

Humidity Control: Many CO₂ incubators are equipped with humidity control systems to maintain a stable relative humidity, which is important for preventing cells from drying out and maintaining a healthy culture.

Sterilization: CO₂ incubators often feature high-temperature sterilization cycles to remove contaminants and maintain a sterile environment for cell cultures.

Carbon Dioxide Sensor: The integrated CO₂ sensor continuously monitors the CO₂ concentration in the chamber and allows the incubator to adjust the gas supply as necessary to maintain the desired CO₂ level.

Shelves and Space: CO₂ incubators are equipped with adjustable shelves that can accommodate different types of culture tanks and maximize space utilization.

Applications:

Cell Culture: CO₂ incubators are primarily used for the growth and maintenance of cell lines, primary cells and mammalian tissues. These controlled environments provide optimal conditions for cell proliferation, differentiation and experiments.

Microbiology: CO₂ incubators are used to grow bacteria, fungi and other microorganisms and provide controlled conditions for the cultivation, identification and research of microorganisms.

Tissue Engineering: In tissue engineering and regenerative medicine, CO₂ incubators create the controlled environment necessary for the growth and differentiation of stem cells into specialized tissues.

Drug testing and development: Pharmaceutical and biotechnology companies use CO₂ incubators to test the effects of drugs and compounds on cells and to develop cell-based tests for drug screening.



FIG: 3.1



FIG:3.2

3.2 PHASE CONTRAST MICROSCOPE

A phase contrast microscope is a special light microscope that increases the contrast and visibility of transparent, colorless biological samples. This is achieved by taking advantage of the phase differences of light waves passing through different parts of the sample, rather than relying solely on differences in light absorption that form the basis of traditional bright-field microscopy. Below are the main features and applications of phase contrast microscopes:

Key FS:

Phase Plates: Phase contrast microscopes are equipped with phase plates or annular rings in the objective and condenser lenses. These components manipulate the phase of the light waves that pass through the sample.

Increased contrast: Phase contrast microscopy increases the contrast between different structures in a sample, making samples transparent and colorless, like living cells, more visible without the need for staining or fixation.

Low light intensity: Unlike other contrast-enhancing techniques such as differential interference contrast microscopy (DIC), phase contrast microscopy uses a relatively low light intensity that is less likely to damage sensitive living samples.

Objectives: Phase contrast objectives are equipped with special phase rings that fit into the phase plates of the condenser, ensuring a correct phase contrast image. **Diopter adjustment:** Phase contrast microscopes often have diopter adjustments on the eyepieces to provide individual adjustments for users with different vision levels.

Applications:

Cell Biology: Phase contrast microscopy is widely used in cell biology to observe and study living cells and their internal structures, including cell division, organelles, and cell movements.

Microbiology: It is suitable in microbiology for the study of bacteria, yeasts and other microorganisms, especially in unstained or living cultures.

Hematology: Phase contrast microscopy is used in clinical settings to examine blood cells such as red blood cells, white blood cells and platelets and helps diagnose diseases and count blood cells.

Embryology: In developmental biology, phase contrast microscopy is used to study embryonic development and cell movement during embryogenesis. **Neuroscience:** Used in neurology to observe neurons, nerve tissues and nerve cell cultures.

Histology: Phase contrast microscopy facilitates the examination of tissue sections and biopsies, especially when the samples are unstained.

Quality Control: Phase contrast microscopes are used in quality control and industrial applications to inspect transparent materials such as fibers, plastics and coatings.



FIG:3.3

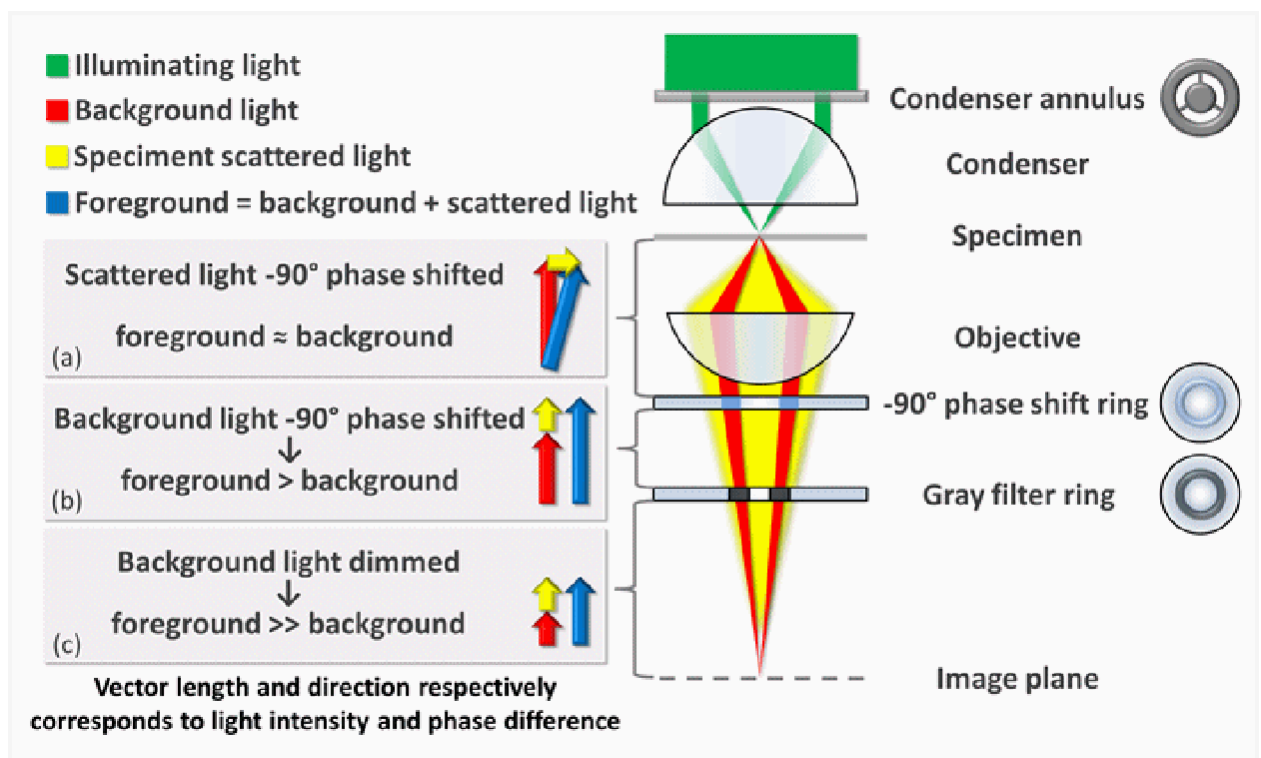


FIG:3.4

3.3 ELISA READER AND WASHER

An enzyme-linked immunosorbent assay (ELISA) reader and scrubber is an integral part of the ELISA process, a biochemical technique often used to detect the presence and quantify the concentration of specific proteins, antibodies, antigens, or other molecules in a sample . ELISA readers and washers are designed to automate and simplify the ELISA testing process, improving accuracy and efficiency. Here are the key FS and functions of these devices:

ELISA reader:

Optical detection: The ELISA reader is equipped with special optics and detectors to measure the optical density (OD) or absorbance of samples in microplate wells. This measurement helps determine the concentration of the target molecule in the sample.

Wavelength Selection: ELISA readers allow users to select specific wavelengths of light (typically in the visible or UV range) to match the absorption properties of the molecules being analyzed. This ensures accurate readings.

Microplate Compatibility: ELISA readers are designed to accept microplates, typically 96- or 384-well plates commonly used in ELISA assays.

Automated Scanning: These instruments automate the scanning of multiple wells in a microplate and quickly and accurately record absorbance values for each well.

Data Analysis: ELISA readers often come with data analysis software that allows users to calculate concentrations, generate standard curves, and export results.

Incubation and Kinetics: Some advanced ELISA readers provide incubation and kinetics measurement capabilities that enable time-resolved measurements and monitoring of reactions over time.

ELISA washing machine :

Plate washing: The ELISA washing machine automates the washing phase of ELISA tests. Completely removes unbound material and debris from microplate wells for clean, accurate results.

Multiple Washing Protocols: ELISA washers provide flexibility by offering multiple washing protocols such as aspiration-dispense, dispense-aspiration, or immersion depending on the specific testing needs.

Adjustable Wash Settings: Users can adjust wash settings including the number of wash cycles, wash buffer volume and aspiration speed to optimize wash efficiency.

Compatibility with Plates: ELISA washers are designed for use with a variety of microplate formats and materials to meet a variety of testing needs.

Reduce Cross-Contamination: These instruments are designed to minimize the risk of cross-contamination between wells and ensure reliable results.

Applications:

Clinical Diagnostics: ELISA readers and washers are widely used in clinical laboratories for disease diagnosis, including the detection of antibodies, antigens, hormones and biomarkers.

Pharmaceutical Research: These tools play a key role in pharmaceutical research by quantifying drug candidates, examining biomarker levels, and assessing drug interactions.

Life science research: ELISA is a fundamental technique in life science research to study protein expression, signaling pathways and molecular interactions.

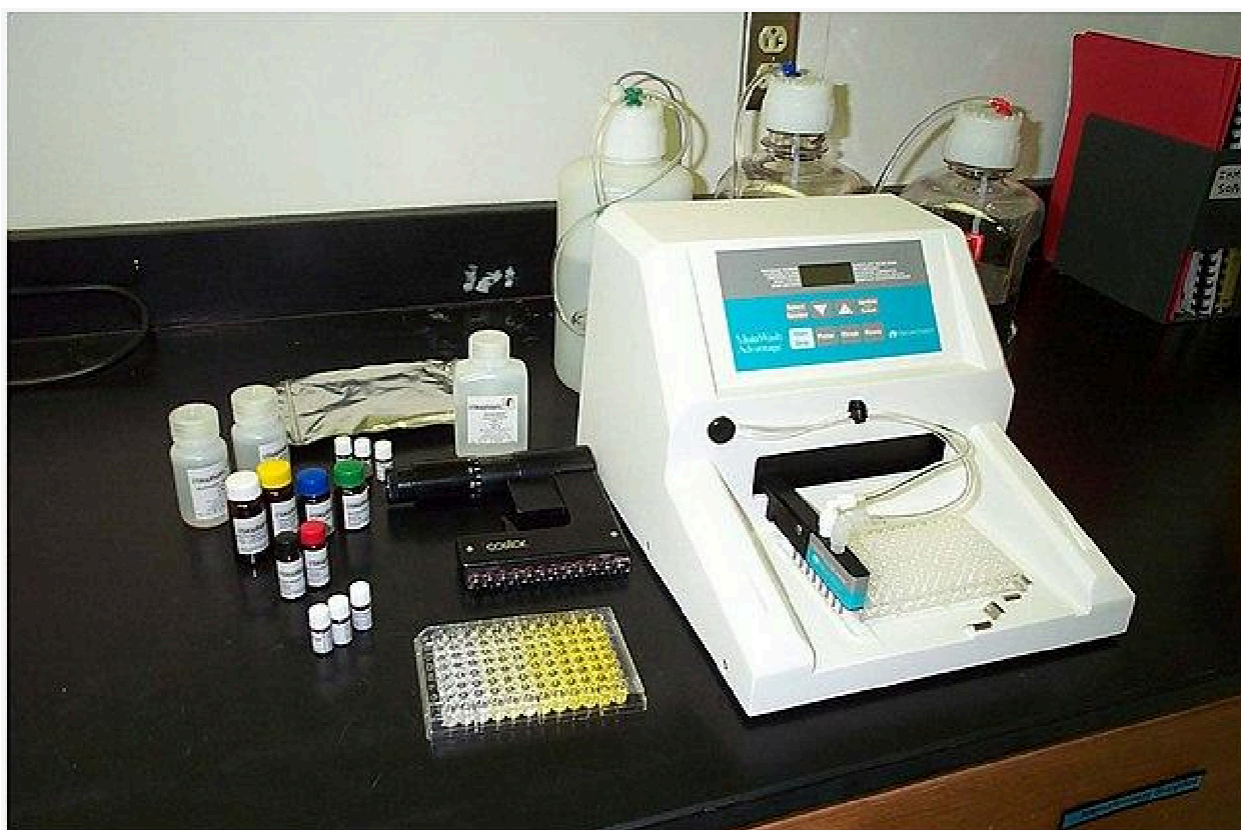


FIG:3.5

3.4 LUMINOMETER

A luminometer is a scientific instrument used to measure the intensity of light emitted during a chemical or biological reaction. Luminometers are widely used in various fields including molecular biology, biochemistry, microbiology and environmental sciences. They are particularly suitable for quantifying luminescence, chemiluminescence and bioluminescence reactions. Here are the key features and applications of luminometers:

Key FS:

Photodetector: Luminometers are equipped with sensitive photodetectors such as photomultiplier tubes (PMTs) or photodiodes that can measure low levels of light with high precision.

Light Detection Range: Luminometers can detect a wide range of light intensities, from very weak signals to strong emissions, depending on the application.

Multiple Detection Modes: Luminometers can provide multiple detection modes including luminescence, fluorescence and absorption, making them versatile tools for a variety of tests.

Filters and Optics: Often contain filters and optical elements that allow specific wavelengths of light to be selected for analysis, thereby increasing the specificity of the signal.

Sample Handling: Luminometers are compatible with a variety of sample formats, including microplates, cuvettes and tubes, depending on the test type.

Temperature Control: Some luminometers have the ability to control temperature and maintain samples at a specific temperature during measurements to ensure test

repeatability

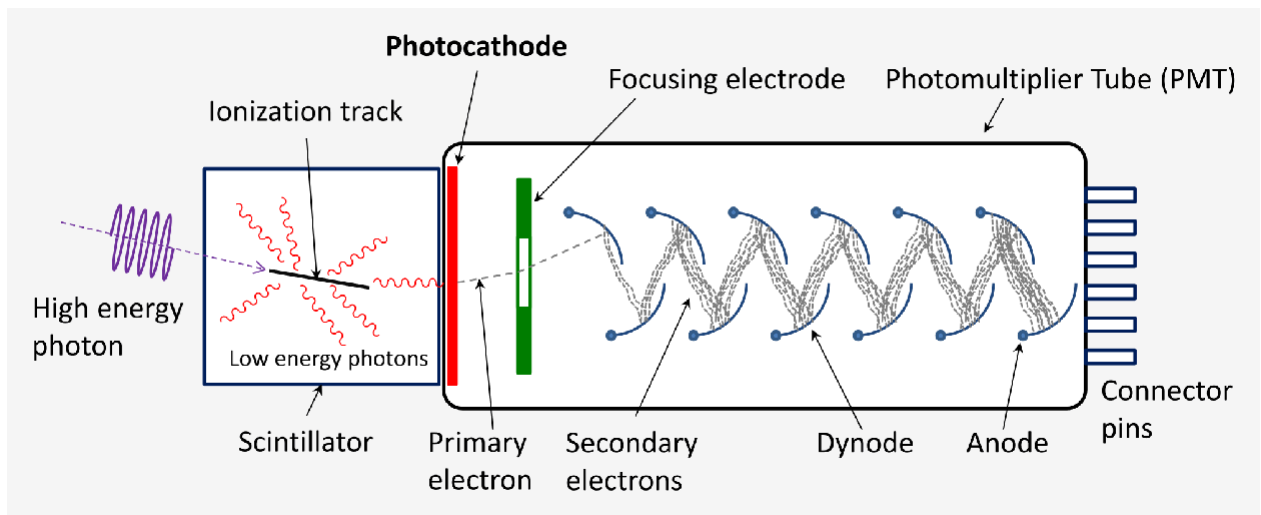


FIG:3.6

CHAPTER 4

CONCLUSION

Overall, my internship experience at the Drug Discovery Instruments Center was insightful and valuable. During this internship, I had the opportunity to work with state-of-the-art equipment and gain hands-on experience with drug discovery tools. I learned a lot about the different tools used in drug discovery, their applications and the key role they play in advancing pharmaceutical research and development.

During my internship, I was familiar with a variety of instruments including Luminometers, spectrophotometers, PCR etc. I had the opportunity to operate, maintain and troubleshoot these instruments, which improved my technical skills and has significantly improved my confidence in using modern laboratory equipment. Additionally, I had the honor of working closely with experienced professionals and researchers in the field. Their guidance and mentorship gave me valuable insights into the practical aspects of drug discovery, research methodology, and the importance of precision and accuracy in experimental work. I also learned about the interdisciplinary nature of drug discovery, where different scientific disciplines come together to address complex challenges related to the development of new therapies.

This internship strengthened my passion for scientific research and allowed me to better understand the essential role that instrumentation and technology play in the drug development process. I am grateful for the opportunity to contribute to ongoing research projects and to see firsthand the impact of innovative tools on drug discovery efforts. This internship not only expanded my knowledge and skills but also allowed me to appreciate the collaborative and dynamic nature of the pharmaceutical industry.

As I continue my academic and professional career, I am confident that the experiences and knowledge I gained during this internship will play a key role in my career in drug development and pharmaceutical research. I would like to express my gratitude to the entire team at the Drug Discovery Instruments Center for the support, guidance and enriching learning environment provided during my internship.

CHAPTER 5

REFERENCES

- 1) www.niaid.nih.gov/research/lab-virology
- 2) www.niaid.nih.gov/research/biodefense-biosafety-labs
- 3) www.nhlbi.nih.gov/news/2021/future-medicine-lab-chip-devices-starting-make-impact
- 4) www.nihlibrary.nih.gov/resources/subject-guides/research-instruments
- 5) www.cancer.gov/types/colorectal/screening-fact-sheet